

What is claimed is:

1 1. A panel display apparatus for displaying an image in a
2 discharge sustain period, comprising:

3 a gas discharge panel in which a plurality of discharge cells
4 are arranged in the form of matrix between a pair of substrates;
5 and

6 a driving circuit which applies a write pulse to selected
7 discharge cells of the plurality of discharge cells to write the
8 image, and applies at least one sustain pulse to each of the
9 plurality of discharge cells to perform a sustain discharge in
10 the selected discharge cells,

11 wherein a pulse waveform of each sustain pulse is determined
12 so that a particular current waveform is formed when the sustain
13 pulse is applied, the particular current waveform being a
14 waveform in which a time from when a peak is reached to when a
15 fall is completed is no more than triple a time from when a rise
16 is started to when the peak is reached.

1 2. A panel display apparatus for displaying an image in a
2 discharge sustain period, comprising:

3 a gas discharge panel in which a plurality of discharge cells
4 are arranged in the form of matrix between a pair of substrates;
5 and

6 a driving circuit which applies a write pulse to selected
7 discharge cells of the plurality of discharge cells to write the
8 image, and applies at least one sustain pulse to each of the
9 plurality of discharge cells to perform a sustain discharge in
10 the selected discharge cells,

11 wherein immediately before a leading edge of each sustain
12 pulse which is applied to the discharge cell, the driving circuit
13 applies a pulse that is opposite in polarity to the sustain
14 pulse, to the discharge cell for a predetermined period.

1 3. The panel display apparatus of Claim 2,

2 wherein an absolute value of a voltage of the pulse that is
3 opposite in polarity to the sustain pulse is no smaller than an
4 absolute value of a voltage of the sustain pulse.

1 4. The panel display apparatus of Claim 3,

2 wherein a time during which the absolute value of the voltage
3 of the pulse is no smaller than the absolute value of the voltage
4 of the sustain pulse is no more than 100ns.

1 5. The panel display apparatus of Claim 3,

2 wherein a time during which the absolute value of the voltage
3 of the pulse is no smaller than the absolute value of the voltage

4. of the sustain pulse is no more than 50ns.

1 6. The panel display apparatus of Claim 2,
2 wherein an absolute value of a voltage of the pulse that is
3 opposite in polarity to the sustain pulse is no smaller than 1.5
4 times an absolute value of a voltage of the sustain pulse.

1 7. A panel display apparatus for displaying an image in a
2 discharge sustain period, comprising:

3 a gas discharge panel in which a plurality of discharge cells
4 are arranged in the form of matrix between a pair of substrates;
5 and

6 a driving circuit which (a) applies a write pulse to selected
7 discharge cells of the plurality of discharge cells to write the
8 image, and (b) successively applies a plurality of sustain pulses
9 which alternate in polarity, to each of the plurality of
10 discharge cells to perform a sustain discharge in the selected
11 discharge cells,

12 wherein immediately before a leading edge of at least a
13 sustain pulse of the plurality of sustain pulses which is first
14 applied to the discharge cell, the driving circuit applies a
15 pulse that is opposite in polarity to the sustain pulse, to the
16 discharge cell for a predetermined period.

1 8. The panel display apparatus of Claim 7,
2 wherein an absolute value of a voltage of the pulse that is
3 opposite in polarity to the sustain pulse is no smaller than an
4 absolute value of a voltage of the sustain pulse.

1 9. The panel display apparatus of Claim 8,
2 wherein a time during which the absolute value of the voltage
3 of the pulse is no smaller than the absolute value of the voltage
4 of the sustain pulse is no more than 100ns.

1 10. The panel display apparatus of Claim 8,
2 wherein a time during which the absolute value of the voltage
3 of the pulse is no smaller than the absolute value of the voltage
4 of the sustain pulse is no more than 50ns.

1 11. The panel display apparatus of Claim 7,
2 wherein an absolute value of a voltage of the pulse that is
3 opposite in polarity to the sustain pulse is no smaller than 1.5
4 times an absolute value of a voltage of the sustain pulse.

1 12. A panel display apparatus comprising:
2 a gas discharge panel in which a plurality of pairs of first

3 and second electrodes covered with a dielectric are arranged
4 between a pair of substrates; and

5 a driving circuit which accumulates a wall charge on the
6 dielectric to write an image, and applies at least one sustain
7 pulse between each pair of first and second electrodes to perform
8 a sustain discharge in areas where the wall charge has been
9 accumulated,

10 wherein immediately before a leading edge of each sustain
11 pulse which is applied between the pair of first and second
12 electrodes, the driving circuit applies a pulse that is opposite
13 in polarity to the sustain pulse, between the pair of first and
14 second electrodes for a predetermined period.

1 13. The panel display apparatus of Claim 12,

2 wherein the driving circuit applies the pulse of the opposite
3 polarity and the sustain pulse between the pair of first and
4 second electrodes, by applying two rectangular pulses that are
5 opposite in polarity, respectively to the first electrode and the
6 second electrode.

1 14. A panel display apparatus comprising:

2 a gas discharge panel in which a plurality of pairs of first
3 and second electrodes covered with a dielectric are arranged

4 between a pair of substrates; and

5 a driving circuit which (a) accumulates a wall charge on the
6 dielectric to write an image, and (b) successively applies a
7 plurality of sustain pulses which alternate in polarity, between
8 each pair of first and second electrodes to perform a sustain
9 discharge in areas where the wall charge has been accumulated,

10 wherein immediately before a leading edge of at least a
11 sustain pulse of the plurality of sustain pulses which is first
12 applied between the pair of first and second electrodes, the
13 driving circuit applies a pulse that is opposite in polarity to
14 the sustain pulse, between the pair of first and second
15 electrodes for a predetermined period.

1 15. A panel display apparatus for displaying an image in a
2 discharge sustain period, comprising:

3 a gas discharge panel in which a plurality of discharge cells
4 are arranged in the form of matrix between a pair of substrates;
5 and

6 a driving circuit which applies a write pulse to selected
7 discharge cells of the plurality of discharge cells to write the
8 image, and applies at least one sustain pulse to each of the
9 plurality of discharge cells to perform a sustain discharge in
10 the selected discharge cells,

11 wherein an absolute value of a voltage of each sustain pulse
12 which is applied to the discharge cell is higher during a first
13 period than a second period, the first period being a fixed
14 period from a leading edge of the sustain pulse, and the second
15 period being a period from a lapse of the fixed period to a
16 trailing edge of the sustain pulse.

1 16. The panel display apparatus of Claim 15,
2 wherein a highest absolute value of the voltage of the
3 sustain pulse in the first period exceeds an absolute value of a
4 discharge firing voltage of the discharge cell, and
5 the absolute value of the voltage of the sustain pulse in the
6 second period is below the absolute value of the discharge firing
7 voltage of the discharge cell.

1 17. The panel display apparatus of Claim 16,
2 wherein a time during which the absolute value of the voltage
3 of the sustain pulse exceeds the absolute value of the discharge
4 firing voltage is no more than 100ns.

1 18. The panel display apparatus of Claim 15,
2 wherein immediately after the trailing edge of the sustain
3 pulse, the driving circuit applies a pulse that is opposite in

4 polarity to the sustain pulse, to the discharge cell for a
5 predetermined period.

1 19. A panel display apparatus comprising:
2 a gas discharge panel in which a plurality of discharge cells
3 are arranged between a pair of substrates; and
4 a driving circuit which (a) applies a write pulse to selected
5 discharge cells of the plurality of discharge cells to write an
6 image, and (b) successively applies a plurality of sustain pulses
7 which alternate in polarity, to each of the plurality of
8 discharge cells to perform a sustain discharge in the selected
9 discharge cells,

10 wherein an absolute value of a voltage of at least a sustain
11 pulse of the plurality of sustain pulses which is first applied
12 to the discharge cell is higher during a first period than a
13 second period, the first period being a fixed period from a
14 leading edge of the sustain pulse, and the second period being a
15 period from a lapse of the fixed period to a trailing edge of the
16 sustain pulse.

1 20. The panel display apparatus of Claim 19,
2 wherein a highest absolute value of the voltage of the
3 sustain pulse in the first period exceeds an absolute value of a

4 discharge firing voltage of the discharge cell, and

5 the absolute value of the voltage of the sustain pulse in the
6 second period is below the absolute value of the discharge firing
7 voltage of the discharge cell.

1 21. The panel display apparatus of Claim 20,

2 wherein a time during which the absolute value of the voltage
3 of the sustain pulse exceeds the absolute value of the discharge
4 firing voltage is no more than 100ns.

1 22. The panel display apparatus of Claim 19,

2 wherein immediately after the trailing edge of the sustain
3 pulse, the driving circuit applies a pulse that is opposite in
4 polarity to the sustain pulse, to the discharge cell for a
5 predetermined period.

1 23. A panel display apparatus for displaying an image in a
2 discharge sustain period, comprising:

3 a gas discharge panel in which a plurality of discharge cells
4 are arranged in the form of matrix between a pair of substrates;
5 and

6 a driving circuit which applies a write pulse to selected
7 discharge cells of the plurality of discharge cells to write the

8 image, and applies at least one sustain pulse to each of the
9 plurality of discharge cells to perform a sustain discharge in
10 the selected discharge cells,

11 wherein immediately after a trailing edge of each sustain
12 pulse which is applied to the discharge cell, the driving circuit
13 applies a pulse that is opposite in polarity to the sustain
14 pulse, to the discharge cell for a predetermined period.

1 24. The panel display apparatus of Claim 23,
2 wherein the predetermined period is no more than 100ns.

1 25. A panel display apparatus comprising:

2 a gas discharge panel in which a plurality of discharge cells
3 are arranged between a pair of substrates; and

4 a driving circuit which (a) applies a write pulse to selected
5 discharge cells of the plurality of discharge cells to write an
6 image, and (b) successively applies a plurality of sustain pulses
7 which alternate in polarity, to each of the plurality of
8 discharge cells to perform a sustain discharge in the selected
9 discharge cells,

10 wherein immediately after a trailing edge of at least a
11 sustain pulse of the plurality of sustain pulses which is first
12 applied to the discharge cell, the driving circuit applies a

13 pulse that is opposite in polarity to the sustain pulse, to the
14 discharge cell for a predetermined period.

1 26. The panel display apparatus of Claim 25,
2 wherein the predetermined period is no more than 100ns.

1 27. A panel display apparatus comprising:
2 a gas discharge panel in which a plurality of pairs of first
3 and second electrodes covered with a dielectric are arranged
4 between a pair of substrates; and

5 a driving circuit which accumulates a wall charge on the
6 dielectric to write an image, and applies at least one sustain
7 pulse between each pair of first and second electrodes to perform
8 a sustain discharge in areas where the wall charge has been
9 accumulated,

10 wherein when applying each sustain pulse between the pair of
11 first and second electrodes, the driving circuit

12 applies a first voltage between the pair of first and second
13 electrodes for a fixed period from a leading edge of the sustain
14 pulse, and

15 applies a second voltage between the pair of first and second
16 electrodes for a period from a lapse of the fixed period to a
17 trailing edge of the sustain pulse, the second voltage having a

18 smaller absolute value than the first voltage.

1 28. The panel display apparatus of Claim 27,
2 wherein the driving circuit applies the first and second
3 voltages between the pair of first and second electrodes, by
4 applying two pulses that are same or opposite in polarity and
5 overlap in time, respectively to the first electrode and the
6 second electrode.

1 29. A panel display apparatus comprising:
2 a gas discharge panel in which a plurality of pairs of first
3 and second electrodes covered with a dielectric are arranged
4 between a pair of substrates; and
5 a driving circuit which accumulates a wall charge on the
6 dielectric to write an image, and applies at least one sustain
7 pulse between each pair of first and second electrodes to perform
8 a sustain discharge in areas where the wall charge has been
9 accumulated,

10 wherein immediately after a trailing edge of each sustain
11 pulse which is applied between the pair of first and second
12 electrodes, the driving circuit applies a pulse that is opposite
13 in polarity to the sustain pulse, between the pair of first and
14 second electrodes for a predetermined period.

1 30. The panel display apparatus of Claim 29,
2 wherein the driving circuit applies the sustain pulse and the
3 pulse of the opposite polarity between the pair of first and
4 second electrodes, by applying two pulses that are same in
5 polarity and overlap in time, respectively to the first electrode
6 and the second electrode.

1 31. A driving method for displaying an image in a discharge
2 sustain period in a gas discharge panel in which a plurality of
3 discharge cells are arranged between a pair of substrates,
4 comprising:

5 a writing step for applying a write pulse to selected
6 discharge cells of the plurality of discharge cells to write the
7 image; and

8 a discharge sustaining step for applying at least one sustain
9 pulse to each of the plurality of discharge cells to perform a
10 sustain discharge in the selected discharge cells,

11 wherein in the discharge sustaining step, immediately before
12 a leading edge of each sustain pulse which is applied to the
13 discharge cell, a pulse that is opposite in polarity to the
14 sustain pulse is applied to the discharge cell for a
15 predetermined period.

1 32. A driving method for displaying an image in a discharge
2 sustain period in a gas discharge panel in which a plurality of
3 discharge cells are arranged between a pair of substrates,
4 comprising:

5 a writing step for applying a write pulse to selected
6 discharge cells of the plurality of discharge cells to write the
7 image; and

8 a discharge sustaining step for successively applying a
9 plurality of sustain pulses which alternate in polarity, to each
10 of the plurality of discharge cells to perform a sustain
11 discharge in the selected discharge cells,

12 wherein in the discharge sustaining step, immediately before
13 a leading edge of at least a sustain pulse of the plurality of
14 sustain pulses which is first applied to the discharge cell, a
15 pulse that is opposite in polarity to the sustain pulse is
16 applied to the discharge cell for a predetermined period.

1 33. A driving method for displaying an image in a discharge
2 sustain period in a gas discharge panel in which a plurality of
3 discharge cells are arranged between a pair of substrates,
4 comprising:

5 a writing step for applying a write pulse to selected

6 discharge cells of the plurality of discharge cells to write the
7 image; and

8 a discharge sustaining step for applying at least one sustain
9 pulse to each of the plurality of discharge cells to perform a
10 sustain discharge in the selected discharge cells,

11 wherein in the discharge sustaining step, an absolute value
12 of a voltage of each sustain pulse which is applied to the
13 discharge cell is higher during a first period than a second
14 period, the first period being a fixed period from a leading edge
15 of the sustain pulse, and the second period being a period from
16 a lapse of the fixed period to a trailing edge of the sustain
17 pulse.

1 34. A driving method for displaying an image in a discharge
2 sustain period in a gas discharge panel in which a plurality of
3 discharge cells are arranged between a pair of substrates,
4 comprising:

5 a writing step for applying a write pulse to selected
6 discharge cells of the plurality of discharge cells to write the
7 image; and

8 a discharge sustaining step for applying at least one sustain
9 pulse to each of the plurality of discharge cells to perform a
10 sustain discharge in the selected discharge cells,

11 wherein in the discharge sustaining step, immediately after
12 a trailing edge of each sustain pulse which is applied to the
13 discharge cell, a pulse that is opposite in polarity to the
14 sustain pulse is applied to the discharge cell for a
15 predetermined period.